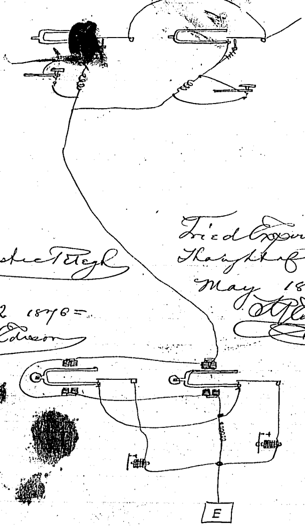
Notebook, Volume 10

This volume covers the period January-November 1876. Most of the notes and drawings are by Edison; others are by Charles Batchelor, James Adams, and John Kruesi. The material in this volume relates primarily to acoustic telegraphy and to the use of the acoustic principle in multiplex telegraphy. There are also a few drawings of the etheroscope. The volume consists of 116 numbered, unbound leaves. Pages 74-85 were numbered in reverse order but have been filmed in their proper sequence.

Missing pages, found in facsimile in the Telephone Interferences: 3, 25, 58, 71, 73, 101-104, 109.

Missing pages: 1, 12, 68, 99.



Acoustic Telegh

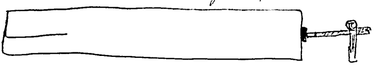
Jany 2 1876 =
T. A. Edison

Tried Experiment
Thought of Idea
May 1876 =
T A Edison

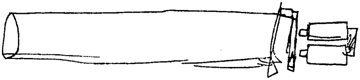
EDISON'S EXHIBIT. 3—10.

Experiments with talking telegraph

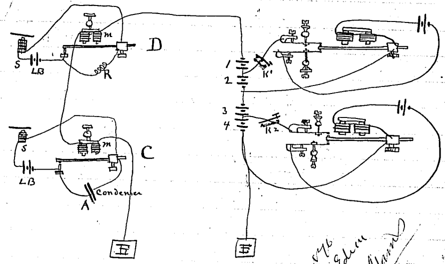
July 6th 1876
July



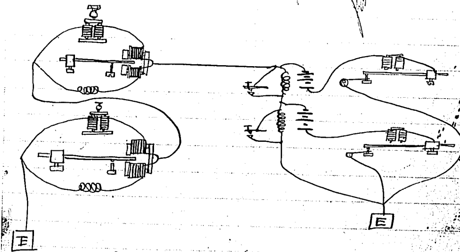
tried a Piece of felt saturated with Water. Salt & water and other chemicals used on a Long Brass tube Brass Diaphram with magnet in ~~front~~ and Iron Armature Pasted on to the Parchment got a good many words Plain such as How do you do—



0/10 ~~Oct~~ 849 1880
Gen Rel Conference

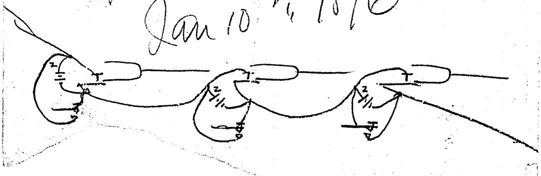

S
LB
m
D
R
S
LB
m
C
A
Condenser
E
1
2
3
4
K'
K2
E

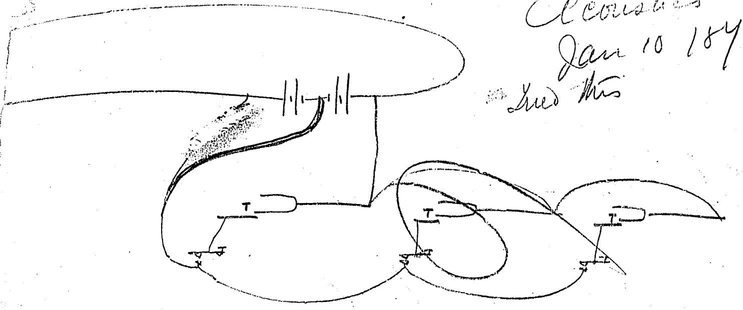
Jany 10 1876
T A Edison
James Adams



Tried this TA Edison Not good

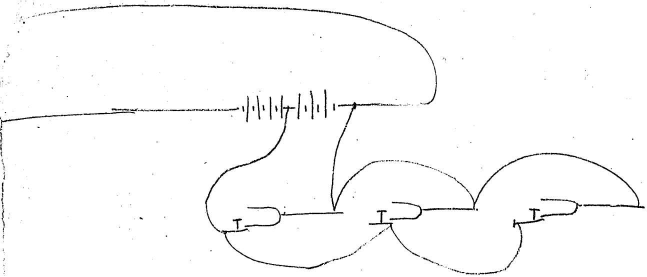
Jan 10th 1876





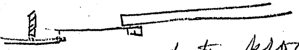
Acoustics
Jan 10 1876
Tried this

6

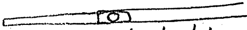


6

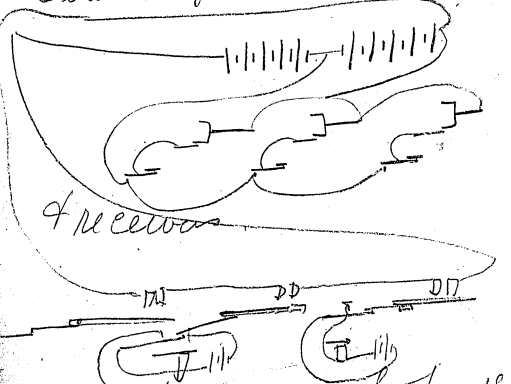
alters Rec/ reeds so that they ought to have been made



so as not to produce a node in them in vibrating so



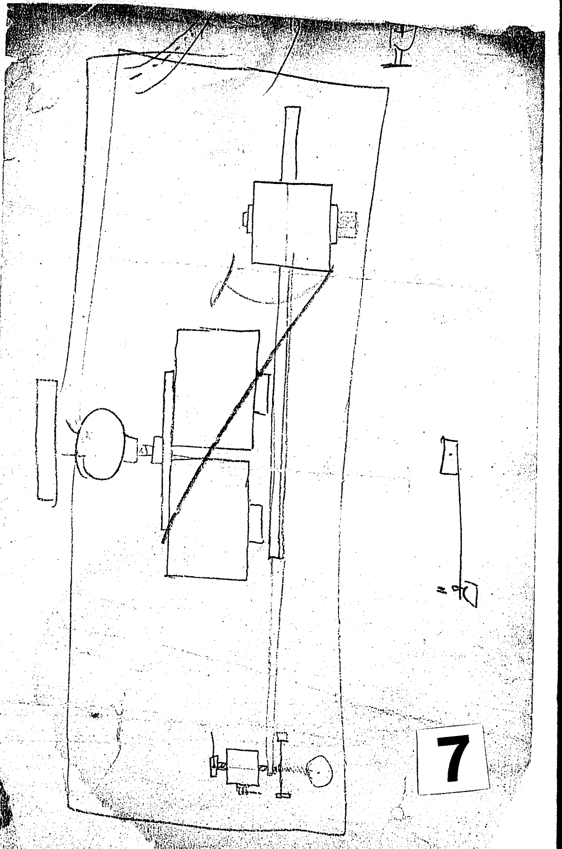
Started tonight with



& receivers

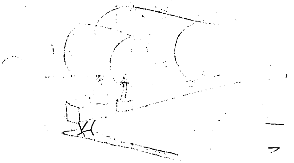
three messages OK on this principle

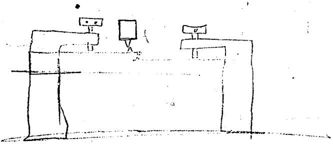
T A Edison

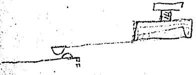


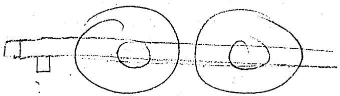
7

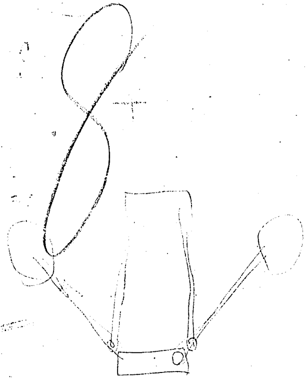
All drawings

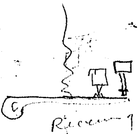








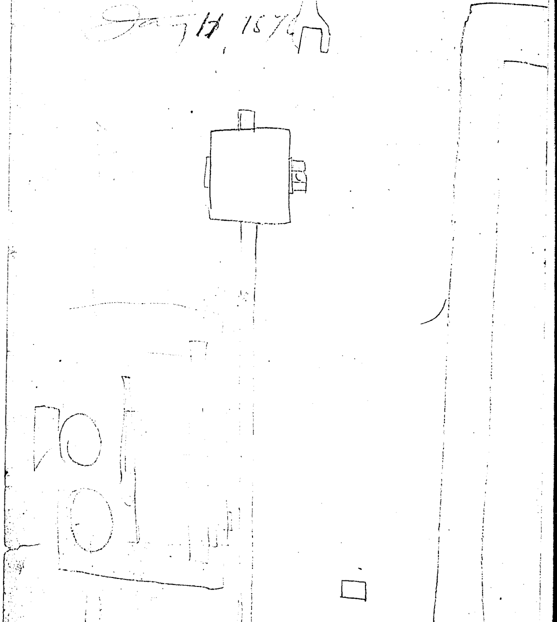



Receiving point

Acoustics

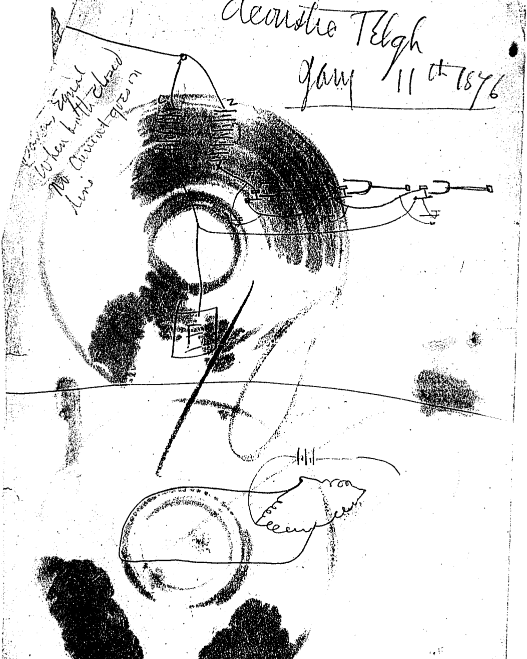
Jany 11 1876

[illegible]
Jany 11, 1876



9

Acoustic Telgh
Jany 11th 1876

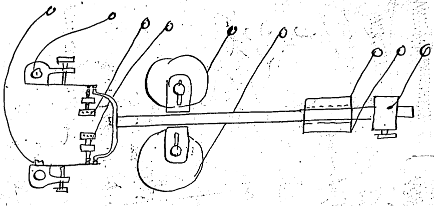


[illegible] Equal
when batt closed
no current goes in
line

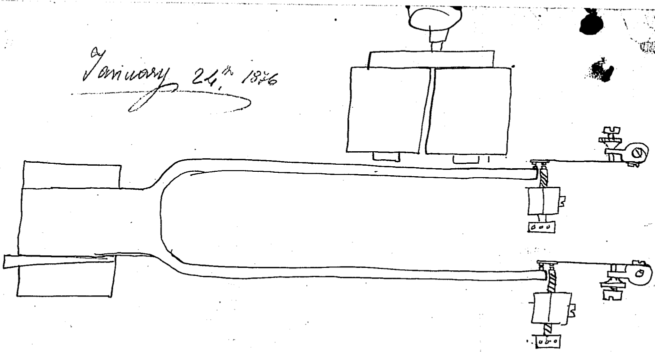
10

Jan. 15th 1876.

North



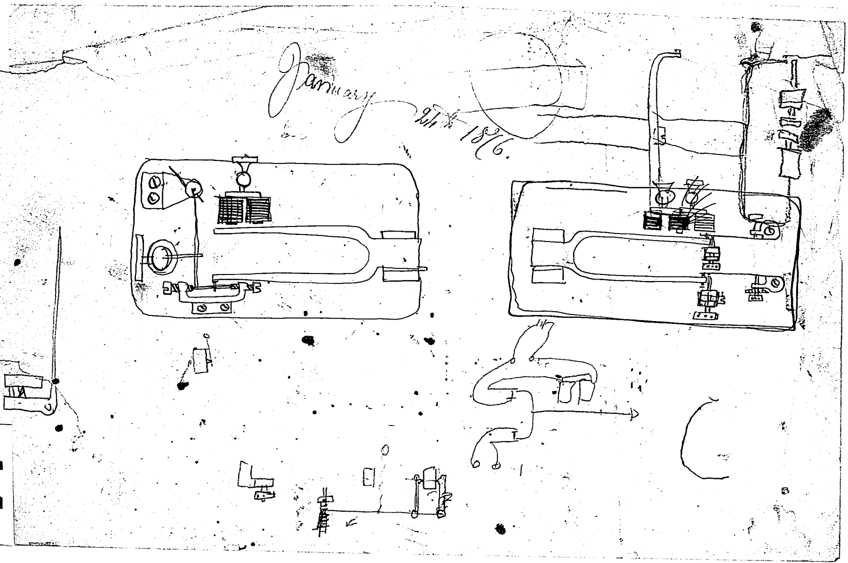
New Style Vibrator

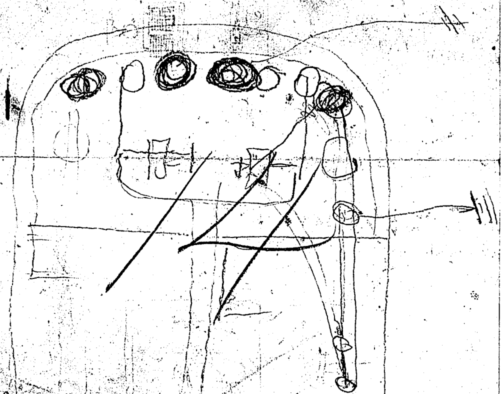


January 24th 1876

13

January 24th 1876.



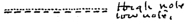


14

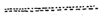
/// //

Tonight. replace the spring selfadjusting points on transmitter with rigid points and make front point more rigid.

Make both higher notes, and much nearer together as it is now we have



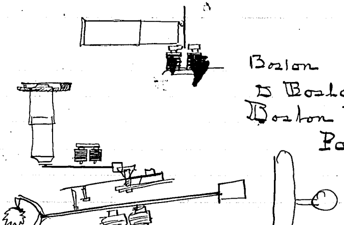
Of course they interfere,
Should be thus



Boston Boston

Boston Boston Boston | Boston Boston
Boston Boston Boston
Jim Gill Butch dad spec. Edison.
Boston Boston

E Gill Butch. see dad spec & jim and on three reeds



Boston
D Boston
Boston Water
Power

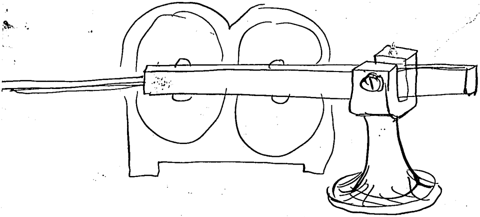
Powerful
Resonance

Jany 25-1876
T A Edison

February 6th 1876 C. Wirth

Wirth =

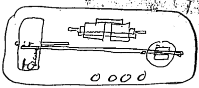
I find that I can make the new acoustic receiver work all right if I do not tighten the screws. It does not want to be so rigid make it thus



It wants to be a pillar that will give a little I think the same size pillar as is used on the magnet for holding the adjusting screw = only fix the one down stairs with the pillar =

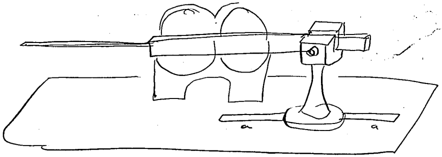
February [illegible] /76

Kurth



Fix the Transmitters so I can put paper in all the same as you have done on the Transmitting reed having the highest note. It is a success

Also ~~put the #~~ two other Receiving reeds together. Making the pillar adjustable in a long slot

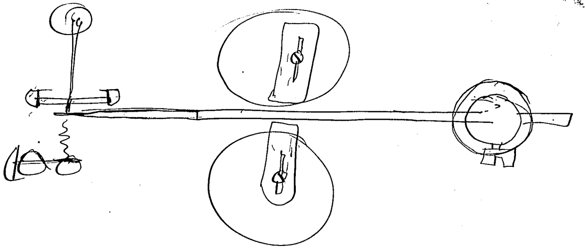


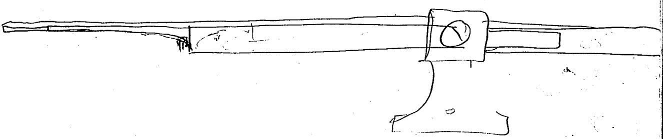
also make the magnets adjustable also the Local points. I have marked in ink on the receiver down stairs about the length of the slots for magnet pillar & Local points. =

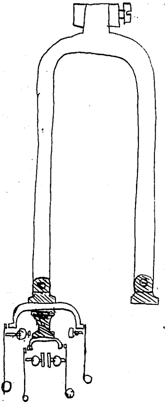
Edison

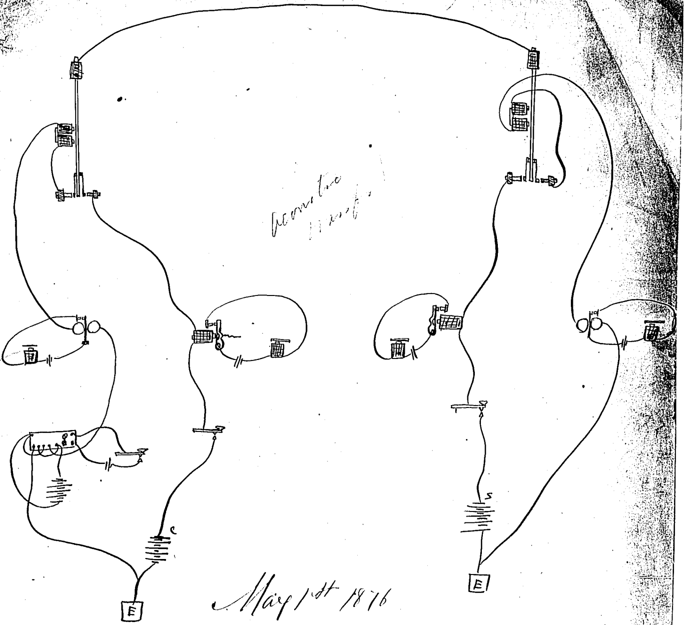
You better put an extension of the hard rubber on so that the adjusting spring pillar will be on it and all be moved together = ~~Put the binding posts in front of the magnets on this side of the reed and solder~~ stiffen up the ~~That~~ spring extension of the reed by adding another piece

February 16 76





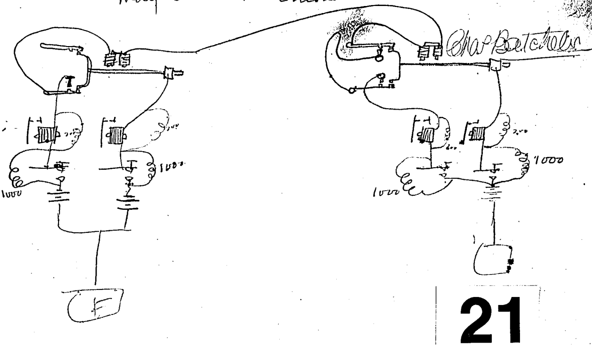




Locomotive [illegible]

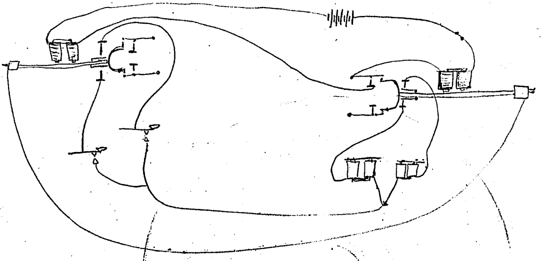
May 1st 1876

Keeping 1 line on two sets of instruments,
May 8 1876. Edison


200
200
1000
1000
F
200
600
1000
1000

Chas Batchelor

21

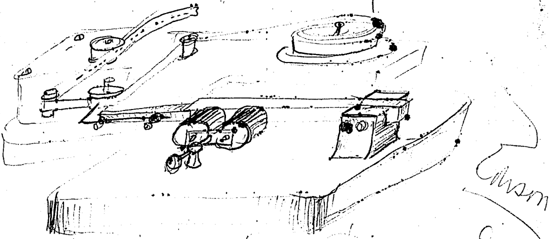


Works red Hot

22

May 8th 1876

May 8 1876



Edison

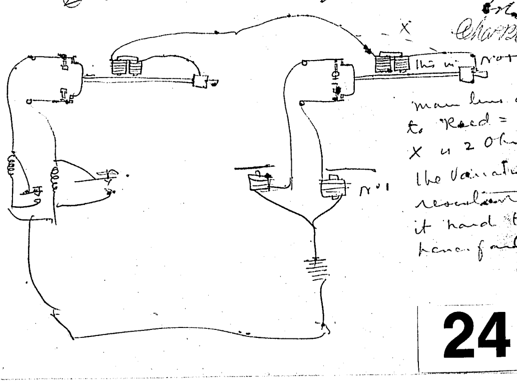
Acoustic Transml

Receiver

23

(2) wires act. 1 — May 8 1876

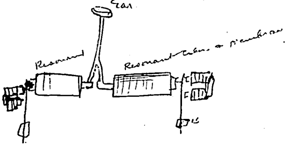
Chas Batchelor



main line direct
to Reed =
X is 2 Ohm spool
the variation in
resistances makes
it hard to adjust
hence failure

24

Acoustic Tel

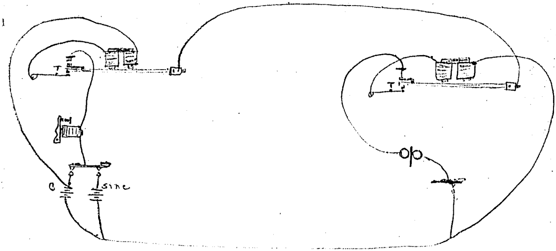

Ear
Resonant
Resonant tube or diaphragm

May 8 1876

One reed one note higher than other,
1st part of distortion on one reed &
other portion other one reed
this giving up & down strokes
distinctive causing the opp to
read conditions trouble

Edison

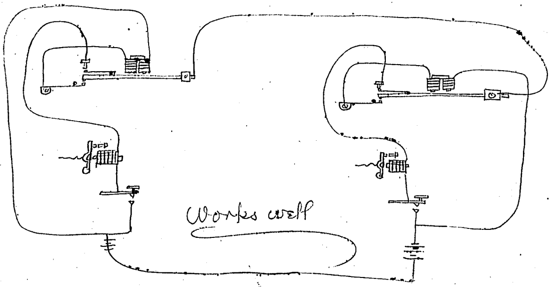
EDISON'S EXHIBIT. 25-10.



Works Splendid

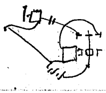
May 10th 1876

26

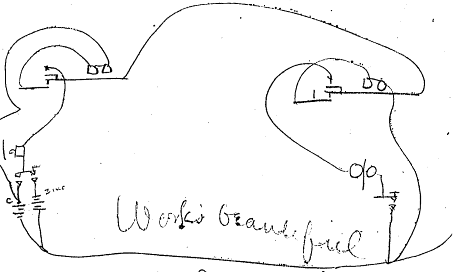


Works well

May 10 1876



27



Works Beautiful

Splendid

May 10 1876

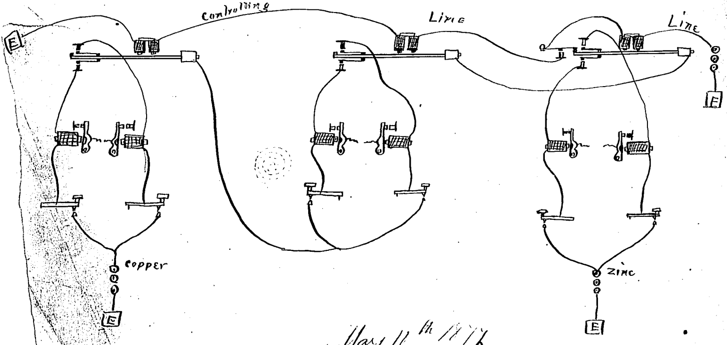
Chas Batchelor

Edison

Even with a single ~~cell~~ polarized relay with slight magnetism or extremely far off when ~~but~~

(Better than Comm relay

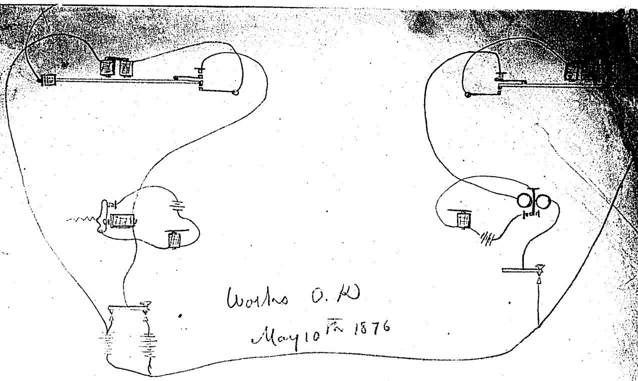
May 10th 1876


E
Controlling
Line
Line
E
Copper
E
Zinc
E

May 11th 1876

James Adams

29



Works O.K

May 10th 1876

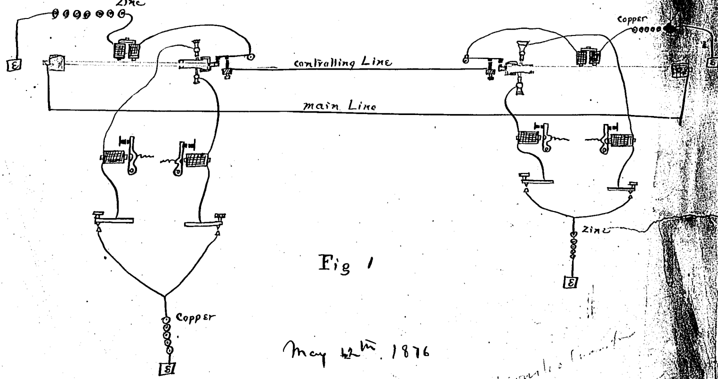
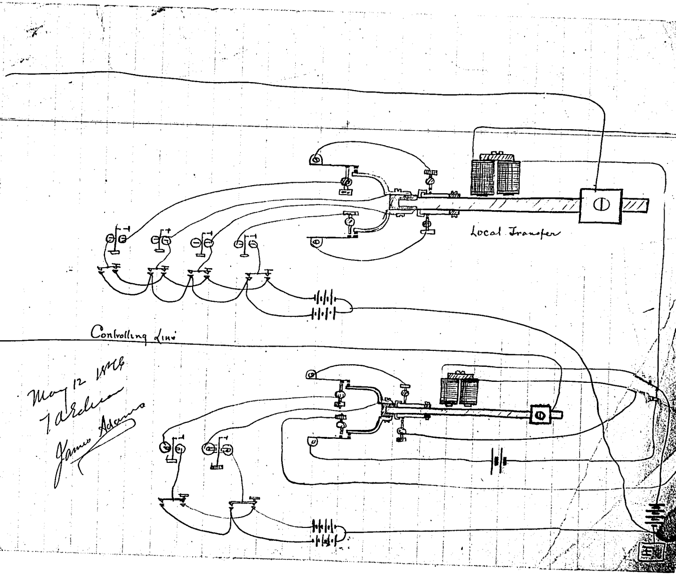
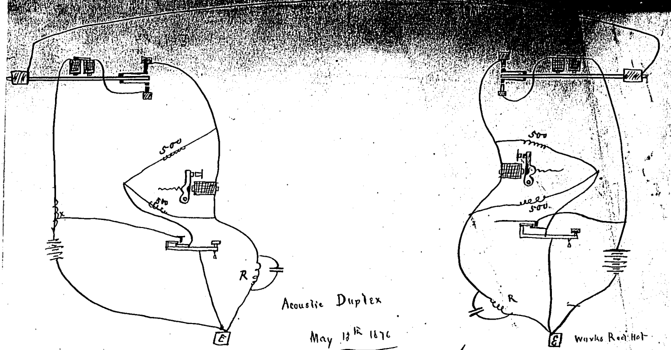

Zinc
Copper
controlling Line
main Line
E
E
Zinc
E
Copper
E

Fig 1

May 12th. 1876


Local Transfer
Controlling Line

May 12 1868
T A Edison
James Adams

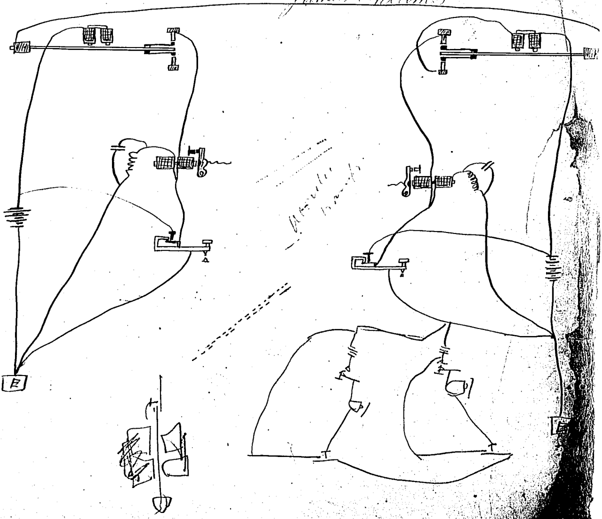

500
500
x
R
E
500
500
R
E

Acoustic Duplex

May 13th 1876

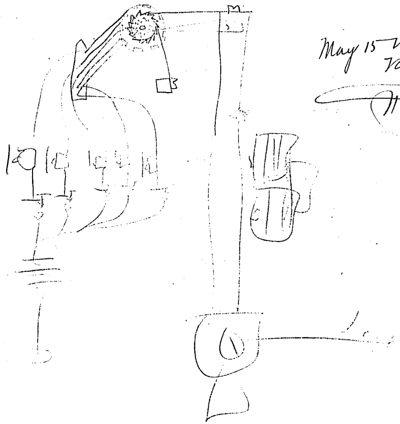
James Adams

Works Red Hot



Acoustic [illegible]

(accoustic obj. ?)

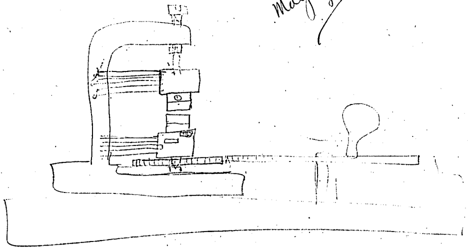


May 15 1876
T A Edison

Wordsworth
33.50

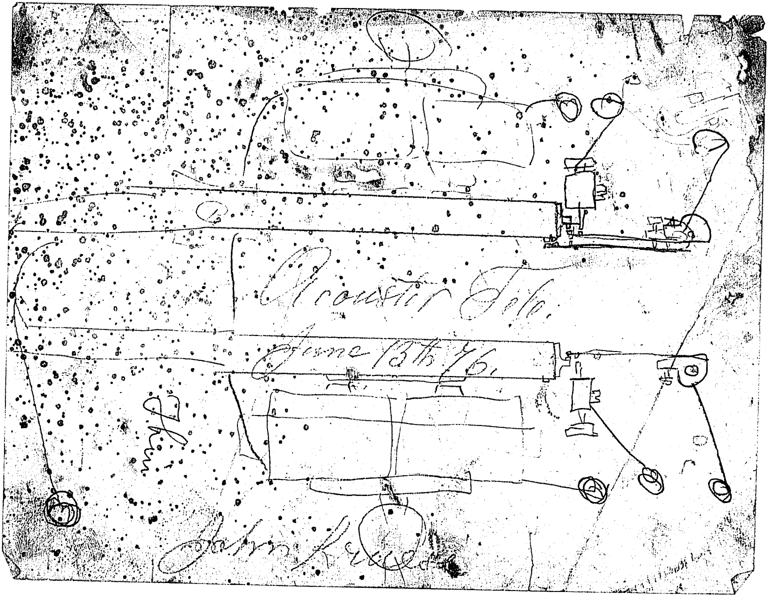
(acoustic teleg. ?)

May 1876
TAE



Boston Boston
This agreement entered

B
Boston Bos



Acoustic Tele.

June 13th 76.

John Kruesi

(acoutic telg.)

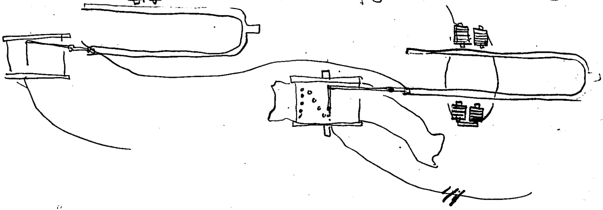
July 1 1876

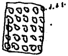
TA Edison

7

60
7)420
42

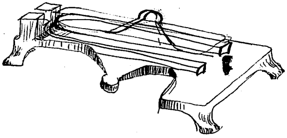
60
3)180
36





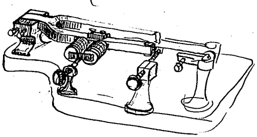
(accoustic Telegraph)

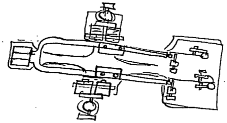
July 2 1876
TAEdison

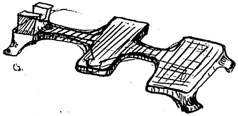


(acoustic teleg.)

July 2 1876
TAE

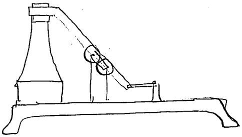


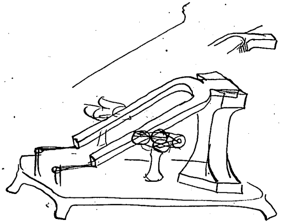




(acoustic teleg.)

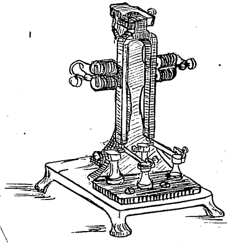
July 2 1876
TAEdison





39

July 2 1876 TAEdison

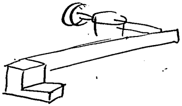


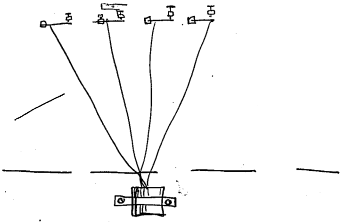
40

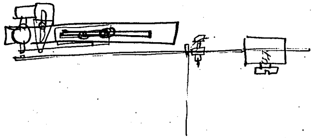
~~TAE~~

July 3 1876 TAE
Adams

James Adams

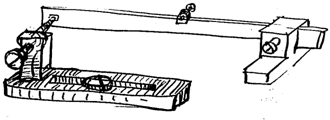




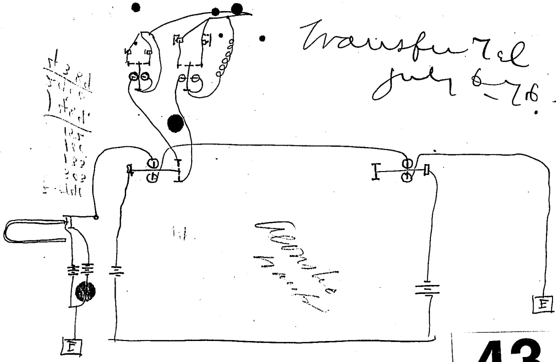


[illegible]

July 5 1876 TAE



James Adams

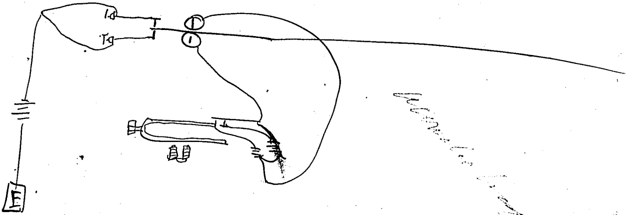


Transfer Tel
July 6 - 76 -

43

Transfer July 7 1876

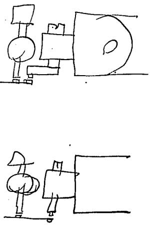
James Adams



BostonBoston BostonBoston
BostonB

44

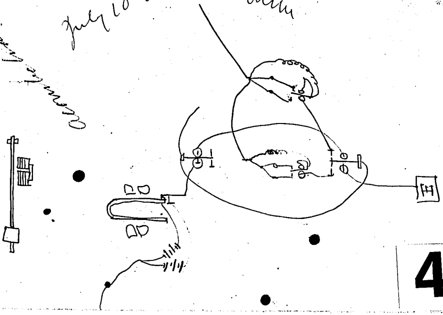
July 10 1876
TAE



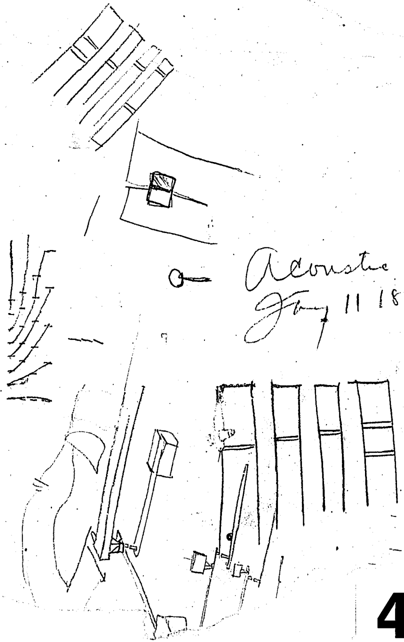
45

July 10 1876 TA Edison

Chas Batchelor

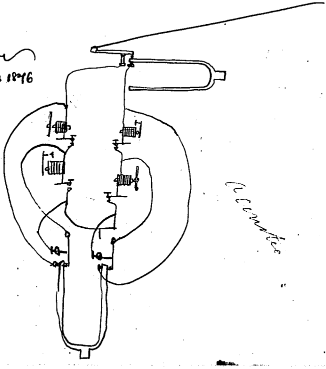


46



Acoustic
Jany 11 1876

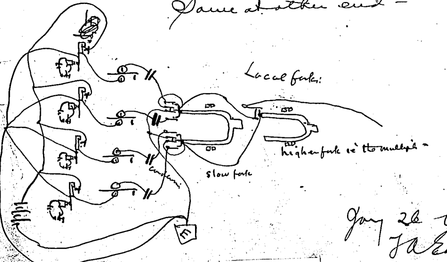
acoustic Transfer
Telegraph July 13 1876
T A Edison
James Adams



acoustic

It is probable that when we get the transfer right with several splits working that we can use one of these splits to work the local thus dispensing with the Controlling line =
Tried this last night and it worked well on a wire between Menlo Pk and Albany & return with only 40 cells small carbon to transmit on

Same at other end -


Local forks:
100
100
100
higher fork ie the multiple
slow fork
Condenser
1
1
1
1
E

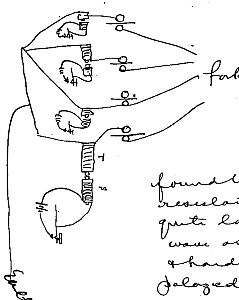
Jany 26 1876.
T A Edison
James Adams

49

On closing the key the Ground is disconnected and the battery connected this rushes over line to the distant station (which in practice will frequently have its condenser cut out (i.e) in the particular split manner) and this wave continues only until the condenser is charged which takes place with tremendous rapidity. this short wave which is perhaps only 1th a length of a simple vibration of the local fork proceeds over the wire & scarcely charges it but is sufficient to throw the tongue of the polarized relay to one side. When the battery is disconnected & the split put to earth the condenser which is now fully charged - discharges through the line in an opposite direction to the wave which passed into it from the line & this serves to throw the tongue of the polarized relay over to the other side. the great advantage of using these short waves & a polarized relay

Consists in using a very weak current which said polarized relays readily respond to and also a very short wave of current of the 2 polarities which are all that is [illegible] required to make dots & dashes; hence the wire is not charged anywise equal to what it is when permanent batteries are used at both ends and the effect of the Escape is entirely prevented in this case by receiving on a ground, when the wire is thrown on one set of instruments the wave is transmitted and then the wire before it is thrown on another set is put to earth simultaneously at both ends so as to discharge as far as possible [illegible] the static charge of the line caused by the passage of this signalling wave & thus prevent it from rushing to Earth through the next set of instruments on which the line is thrown instead of the Condenser we tried using the induced current from an Electromagnet

Thus

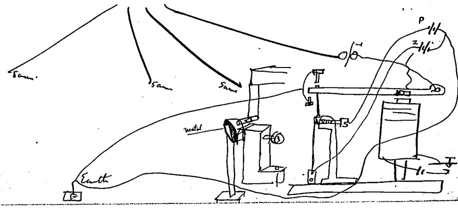


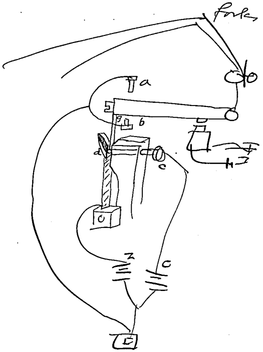
July 26 1876
T A Edison

found that S must be of considerable resistance & that T should be quite long so as to lengthen the wave as it is exceedingly short & hardly sufficient to throw the polarized relay over to the other end, by nursing etc perhaps this would work satisfactorily it has one advantage that way stations are used & local batteries will be all that is required to work the inductor magnet thus dispensing with main battery = we also tried in place of S & T a differential magnet one set of coils in line the other in local with key. this was not so powerful but could be made so ——

July 26 1876
T A Edison

Inplace of reverse induction currents of short duration, inverted battery currents could be used and special mechanical devices used. so that upon closing the key, it or a sounder operated by local & key could be made to connect the battery P to line for an instant & then ground Then upon opening the key the ground could be removed and Z pole of the battery connected to the line for an instant followed by dead Earth the idea is illustrated as below; of course there are many ways of doing this which any skilled person in the business could accomplish =



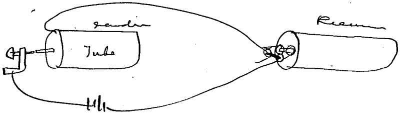


when key open lever of sounder rests on a puts split to Earth. in passing downward rubs on face of C mounted in ivory or other insulating substance = that sends Copper Current of short duration over wire. when lever of sounder touches b & grounds split again = when lever rais platina cylinder on end of spring g passes on the metal d & connect. Z pole of Battery to line for instant when it rises over. Top of d when lever touch a & grounds again

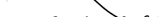
It may be necessary to shunt the polarized relays with either a Condenser or a Secondary battery so as to hold the lever or tongue to either side while no current is being received over wire thus preventing Extraneous Currents from Effecting the relays— Or perhaps by the use of reverse batteries a strong wave could be sent to throw the lever over immediately followed by a weak continuous wave to hold it & so on always keeping weak current on line to hold lever on one or the other side,

Last week we tried numerous experiments with a Speaking Acoustic telegraph whereby the human voice could be transmitted over a wire & which I have neglected to record =

~~fr~~

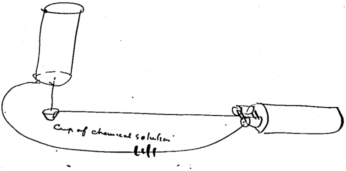


brass diaphram also used parchment.
sending Had a projection from middle of
diaphram to a Contact screw by speaking
in tube diaphram set in motion & breaks
transmitted to recevr ~~set~~ the magnet acting
on armature secured to diaphram set it
in motion. Speaking was inferior but the
Singing was very clear & nice,
tried tubes of various diameters & length.
diaphrams of various thicknesses
also



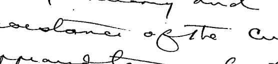
in End of box placed several diaphrams
of different diameters each of which had
a contact point the point screwing to

Cut in & out of the circuit resistance but never breaking the continuity of the circuit, this owing to bad construction of apparatus appeared to be a failure yet I think if properly made it would be a success. also tried a single diaphram.



with platina point dipping in a electrolytic Solution the vibration of the diaphram serving to ~~ma~~ transmit waves to the receiver by increasing and decreasing the resistance of the circuit, This appeared to give best results

Tried

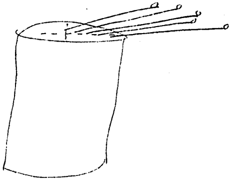


vibrating thread

EDISON'S EXHIBIT. 58–10.

over which were contact lever cutting in & out resistance Experiment was tried in very bad way & got no results but think there is something in it.

This may work



Spark here

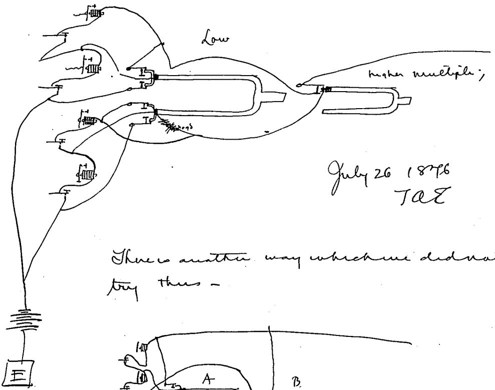
I think the high notes are made by the middle of diaphram only vibrating while as the notes are lower more of the diaphram vibrates. hence by placing Contact points from Centre to rim may get different rates & have Levers cut in & out resistance

July 26 1876
T A Edison
Good night
1 am

James Adams

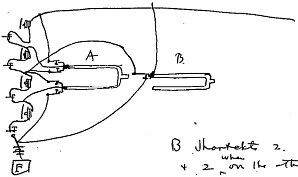
There is a different plan for transfer which we tried and which appears to work very well which is the cutting in and out of the main circuit two receiving instrument simultaneously at both ends of the circuit at the same time. and then doing the same one after the other of several instrument, We found that it worked perhaps more satisfactory with common instruments than by the transfer of the wire from one set of instrument to the other. probably on account of the short circuit which closes on each instrument immediately after being thrown in the line acting as a shunt to allow of the circulation of the self induced current of the magnet itself which has a tendency to make the magnetism of the cores more continuous. The drawing is shown on the next page; there is a difficulty with this which is the difficulty of discharging the wire after

or between Each transfer. we tried innumerable devices such as Condensers magnet secondary batteries arranged in various ways with the instruments & control devices to compensate for the static charge of the line but with small success. Drawing shows one End.
(Commenced about month ago)



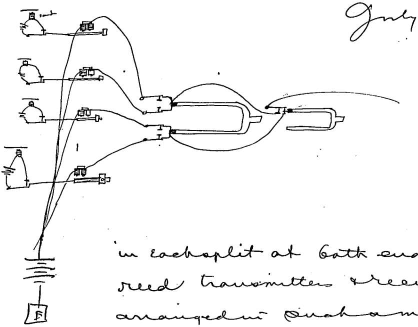
July 26 1876
TAE

There is another way which we did not try thus –



B Shortckts 2. when on one side & 2 when on the other side.
A. Short ckts 1 on one side 1 on other

Perhaps the following would work upon a line with great static Capacity. as the reeds would only respond to their particular rate & independent of all Extraneous current out of time with it no matter of very strong

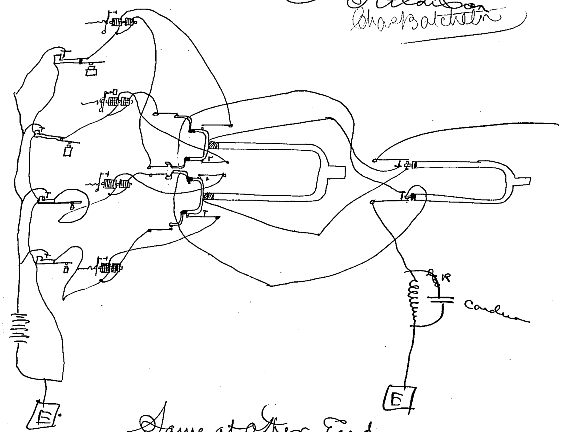


July 27 1876
T A Edison

in each split at both ends are reed transmitters & receivers. arranged in such a manner that. you can send or receive the rates of vibration being very much greater on lowest Reed than the transfer or Switch forks —

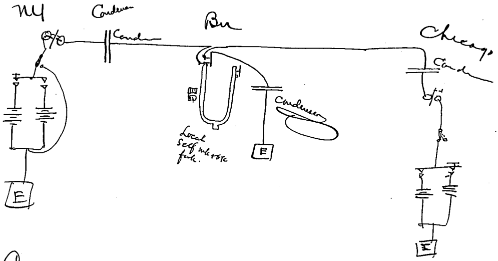
It seems probably that a system of Compensation Could be ablained by using artificial line & Extra split using also differential relays thus.

July 27 1876
T A Edison
Chas Batchelor



Same at Other End

A Repeater


NY
Condenser
Cond
Bn
Chicago
Cond
Condenser
Local Self mk + brk fork.
E
E
E

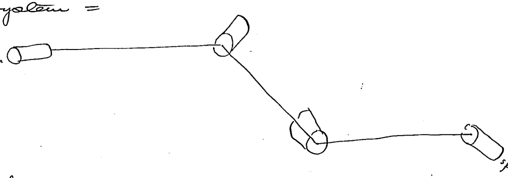
Can be several transfer forks put in along wire. this circumvents the law of the squares =

Conceived about 3 weeks ago July 27 1876

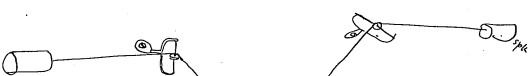
T A Edison
James Adams

Acoustic annunciator for stable private house Etc.

Use tin tube covered with a diaphram & use silk thread as Conductor of the vibrations turn corners by use of wheels and also diaphrams — Have tried large number of Experiments with this system =



also.

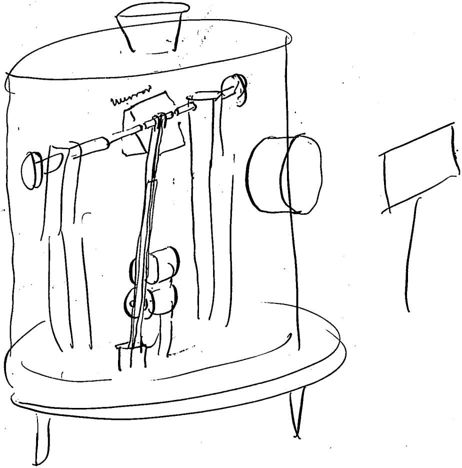


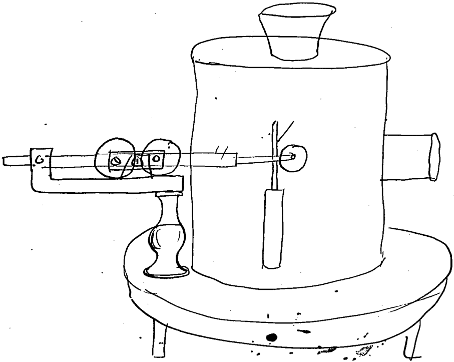
James Adams

July 27. 1876
T.A.E.

Tried this 2 weeks ago
works fairly

I propose to make a Etherescope thus

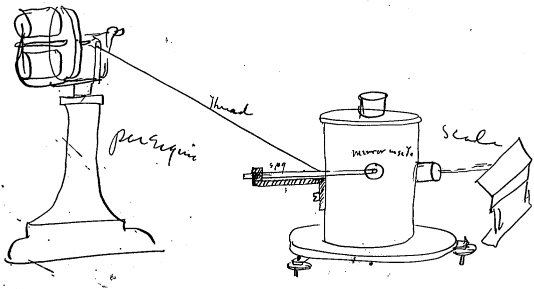




Thermoscope July 27, 1878

TAE

James Adams

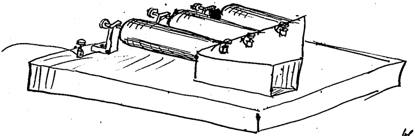

Thread
perEnquin
Spg
mirror insite
Scale

Etheriscope

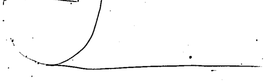
July 27 1876 T A Edison

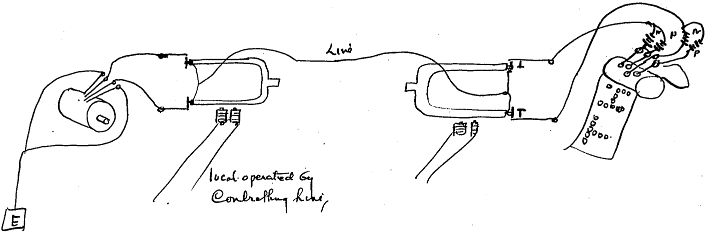
James Adams

speaking Telegh



1876
July 24
T A Edison



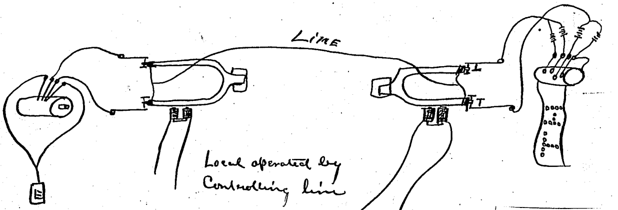


local operated by
Controlling line,

Acoustic transfer
Roman Letter Chemical
printing telegraph =
July 27 1876
T A Edison

James Adams

70

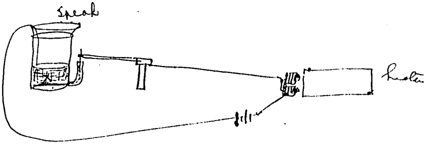


Local operated by
Controlling line

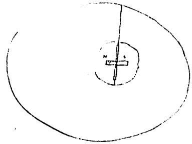
Acoustic transfer
Roman letter chemical
Printing telegraph
July 27th 1876 Adams

72

EDISON'S EXHIBIT. 71—10.



X water Idea being to speak in Beaker & set the water vibrating thus giving large amplitude in small side tube & thus increase & decrease the resistance giving the proper waves to magnet so as to carry on a Conversation =



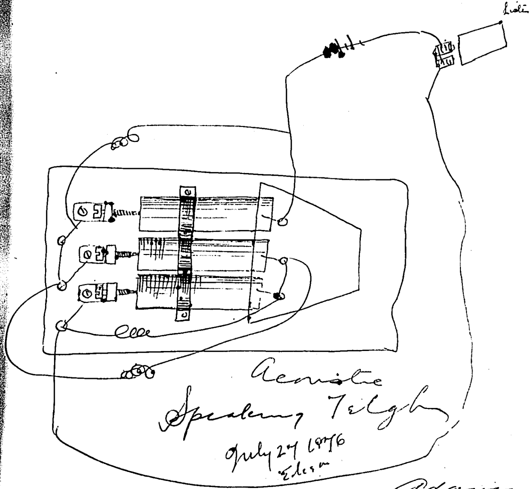
Instead of employing a ~~large~~ Lens mirror on the needle of a. Thomson. Mirror galvanometer I propose to employ a thick mirror about 1/2 inch long & 1/32 inch wide or even smaller =

July 29 1876
T A Edison

73
10

Sept 8 – 9
Gen. Lee Interference

EDISON'S EXHIBIT. 73-10.



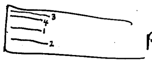
Acoustic Speaking Telegh

July 27 1876
Edison

James Adams

11

(July 28, 1876)



Position of lines

Acoustic Transfer.

Experiments with a Chemical recording instrument at the receiving end with the 4 split Connected to ~~the~~ four non recording points drawn to ground at other end 60 cell small battery Relays in splits. Phila wire, weather moist Kennedy reports wires little soggy = Samples marked A. result of wkg 1 Key at time making long dashes = ~~Noticed that No 3 [illegible]~~

Exhibits B are the record with the ground wire inserted in the low forks the supposition being that immediately after the line has been taken from 1 set instrument

& before it is put on another the idea being that putting wire to dead Earth would free it of the return charge

Exhibit .C. is the wire on short ckt, the ground wire having been insul[illegible] on the multiple forks at both ends thus

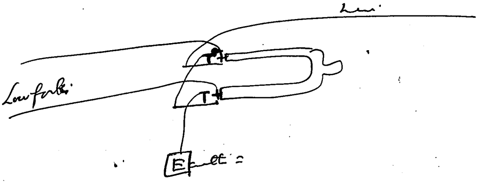


Exhibit D Shews same with Phila on — These shew where the mysterious bug was; the device for "Earthing" the wire on the low forks was a failure while that on the multiple is a success = now this Explains

why all my runkles failed
Exhibit E will shew ~~that~~
the Effect of the return charges
~~so~~ ascertain if the groundwire
is sufficient to discharge & to
prevent it entering into the
equalizing splits = The End
sending Exhibits A, B, C & D
is now to Earth with Keys closed.
Nos 4 1 & 2 splits are to pens at
recg ~~[illegible]~~ end while 3 is
Connected to Key & batty 36
cells Callaud, our next Exhibit
will shew the ~~return~~ chg. from
60 small Carbon =
Result. No return charge
from 3 wi altho 36 cells Callaud

Now for 60. Carbon small + 36 Callaud
Combined = This will be Exhibit F

F. as Carbon was to line return
Charge was zinc to paris hence
Exhibits F are delusive as marks
came under matt paper
We reversed battery to make
it correct and get Exhibit
G when the loop to Phila
got foul of another wire with
battery on & stopped us.
going to get RR Station on our
short to get N.Y. so we can
have it fixed = 12 Midnight

T A Edison

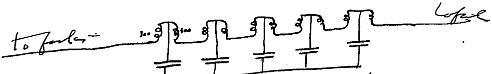
July 28 1876

Phila wire having busted
we now make an Artificial line

Composed of 5 resistance Boxes
Phelps Duplex patent.
with 5. Duplex Phelps Condensers

Thus

Total R. 3000 ohms.



4 sheets in each condenser.

We now resume the test of the return charge from 60 cells small carbon & 36 Callaud together.—

Exhibit G.

Exhibit H shows same Condensing power but with — 7,000 ohms R.R.

Exhibit I shews 12 sheets in each Condenser – ~~[illegible]~~ think can just detect a little return charge

Exhibit J shews with same resist[illegible] but with 28 sheets on each Condenser = deflection of return charge [illegible]..

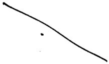
Exhibit K shews same resistance but 72 sheets Condenser in each. It seems Evident something is wrong – we reverse battery ~~Exhibit~~ No – the ground wire being taken off we get Exhibit .L. Which shews return charge is we have Copper to line – L shews on 2 best 4 next best then .1.

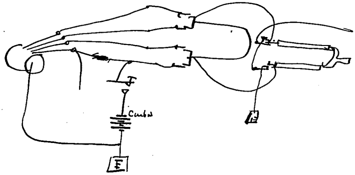
We have in Exhibit M. the
return charge with fork
ground wire disconnected at
both ends = 72 sheets ~~Cond~~ in
each condenser & 7000 ohms
resistance.

Exhibit N Same with ground on fork
at distant end =

O. shows with both grounds on

We now reverse battery, i.e. zinc to line
R ~~Shows~~ get nothing —
I do not understand why we
send out a carbon current & get
back = a carbon current.
Pens are arranged thus





Perhaps the forks are little out unison and. its is leakage back through contact points,

Return Chg —

Exhibit .P. shows ground wire off at recg station on at dif distant station with splits to Earth. also with both fork grounds off also with all splits & fork ground off at distant = 4000 ohms in 5 resistance Coils = 74 sheet Condenser on each of 5 condensers
It also shows with distant entirely open with ground here =

Exhibit Q. shews instant end
open split ground & all =
at this end. on main Carbon to line.
in our ground. we have a reverse
battery. Zinc to line with 15.
cells — kills return completely.

R1 Shews 5 cells on neutralizing battery.
R2 " 10 " "
R3 " 15

added 84 sheets to the 5 Condensers.

S1 shews 5 cells on neutralizing battery

Now 15000 ohms. 91 sheets C
on each of 5 Condensers.

T.1 5 cells on neutralizing Battery
T2 10 "
T.3. 15 wiped out =

New Experiments.

7000 ohms. 91 sheets each of the 8 Condrs

Key closed putting. 60 Carb & 36 Cal to line

15 cells opposite in Fork ground

other End all open

Exhibit .U'. Key closed. no Exhibit

nothing = Working Key - no exhibit nothing

Other End Closed, our battery to line

nothing — making dashes, nothing =

= Found that by putting back instruments for signalling that with 91 sheets Condenser the rush in charge ~~when~~ acting like an Escape and although we could only just get dashes. the Correctness of the inference drawn from the above Experiments cannot be doubted that is that the insertion ~~of a~~

wire in the Multiple forks at both
ends to discharge the wire after
Each wave is a *big* success
& gives me the required compensation
& which can be made as powerful
as desired by the insertion of
neutralizing & opposite pole
battery in these ground wires,
If we receive on a ground
undoubtedly the signals
will be perfect on very long
~~Ext~~ Lines, & I am certain they
will be if way stations are used
whose multiple forks have also
a ground = =. with battery at
both ends we find that we havent
near the margin. but I think there
will be no difficulty in wkg from NY
to Washington direct with the 2
grounds in the Multiple fork

we Close our laborous
night at 5,30, am

T. A. Edison

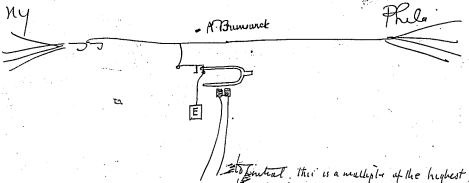
July 28 1876

A & Gil on

Acoustic Transfer

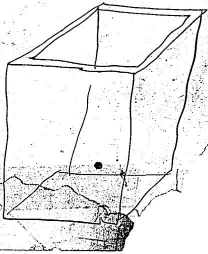
July 28 1876.

T A Edison

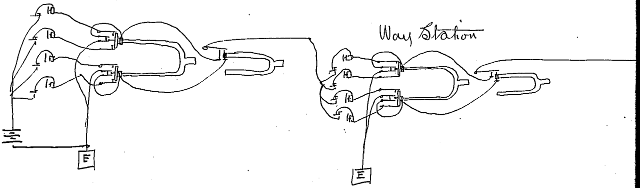


Identical. this is a multiple of the highest transfer fork

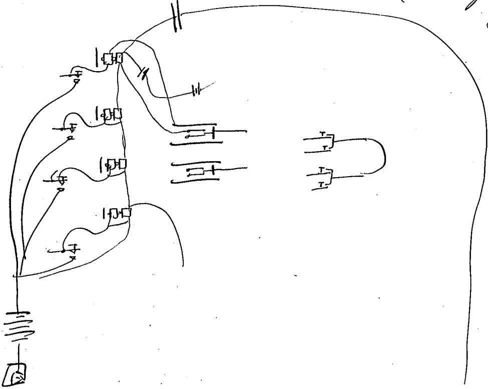
The way station fork serves to discharge wire in midle and thus circumnavigate the law of the squares; I think it probable that the line could be put to earth after each wave simultaneous at several stations,



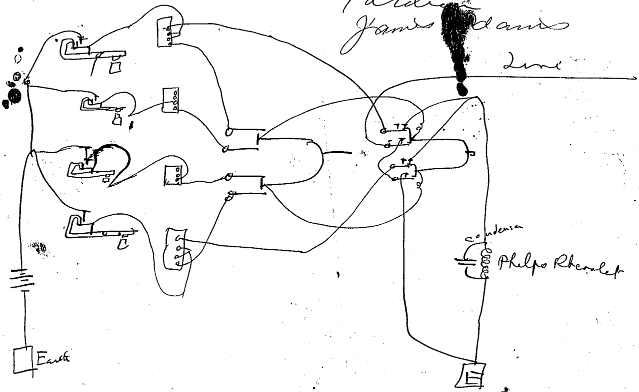
Acoustic Transf.
July 29 1876

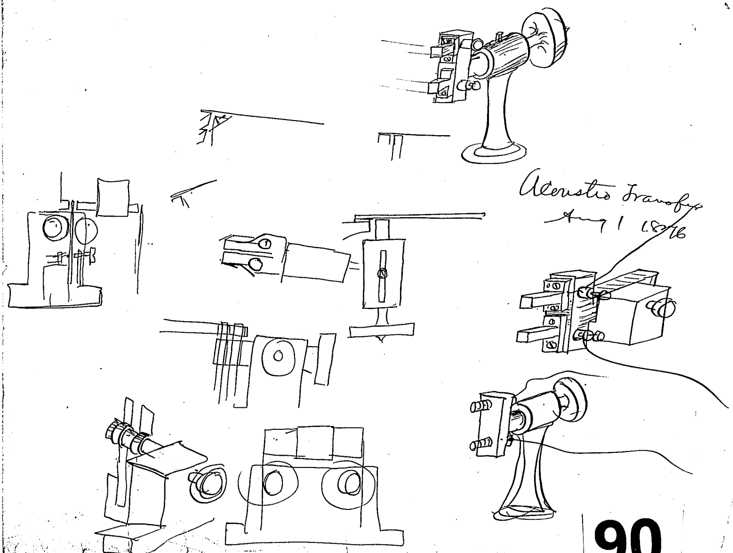

Way Station
E
E

Acoustic Transfer
Aug 1 1876.
T A Edison



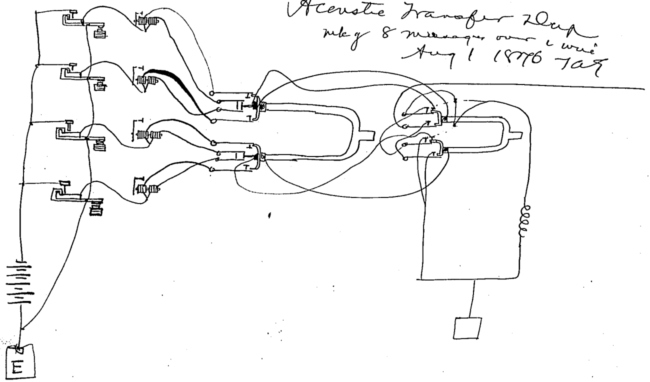
Acoustic Transfer
Aug 1 1876
T A Edison
James [illegible]dams

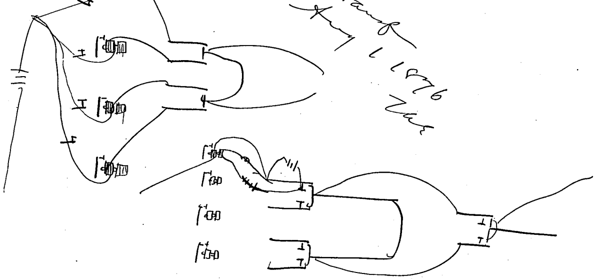

Line
condenser
Phelps Rheostat
Earth



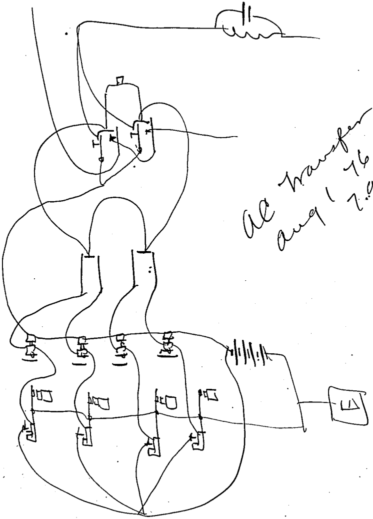
Acoustic Transfer
Aug 1 1876

Acoustic Transfer Dup
mkg 8 messages over 1 wire
Aug 1 1876 TAE

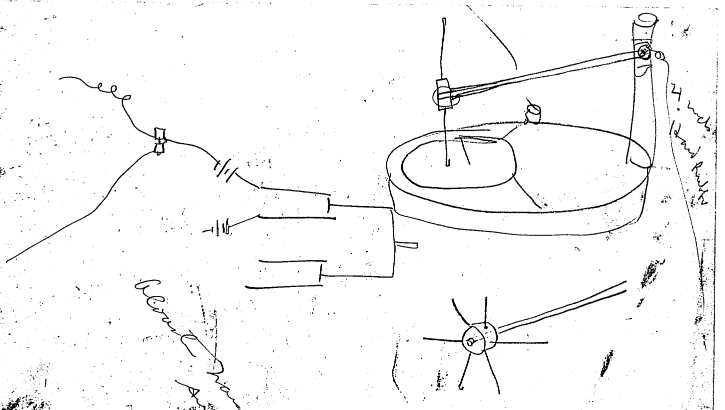




Acoustic Transf
Aug 1 1876

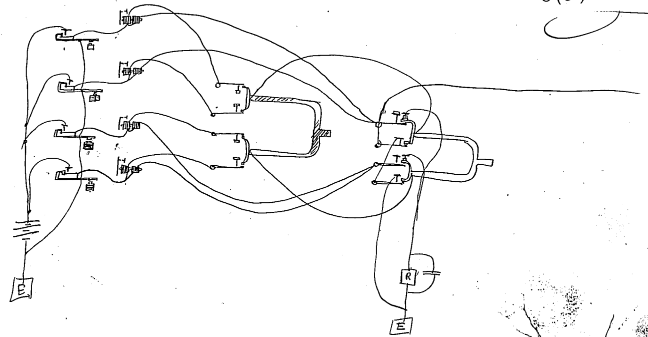


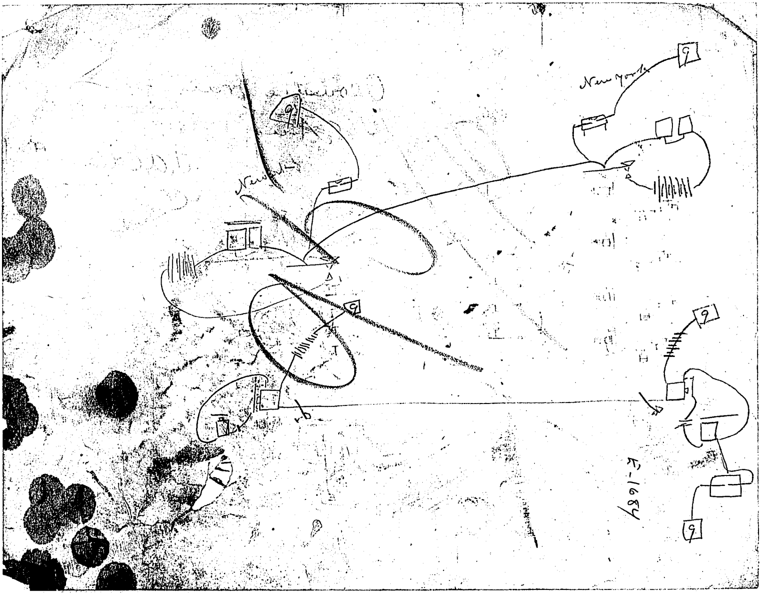
All Transfer
Aug 1 76
T.A.E.

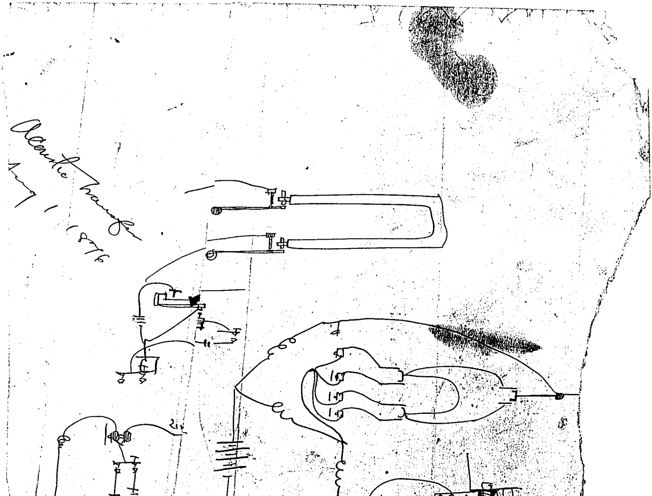

4 inch
12 and Rubber

About Manfd
Aug 1, 1878 TAE

Acoustic Transfer
Duplexed
Aug 1 1876
T. A. Edison

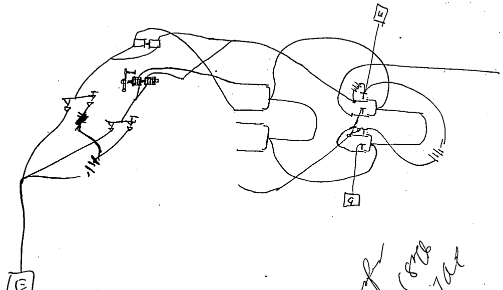



New York
Newark
6
6
6
6
K-1684

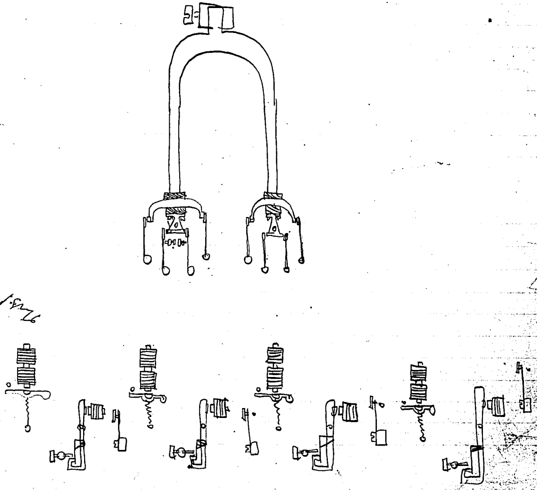


Acoustic Transfer

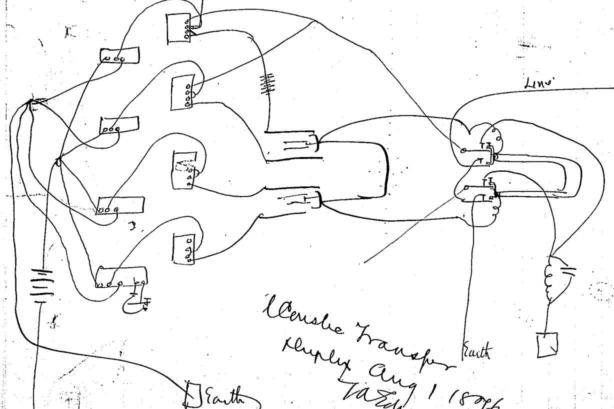
Aug 1 1876



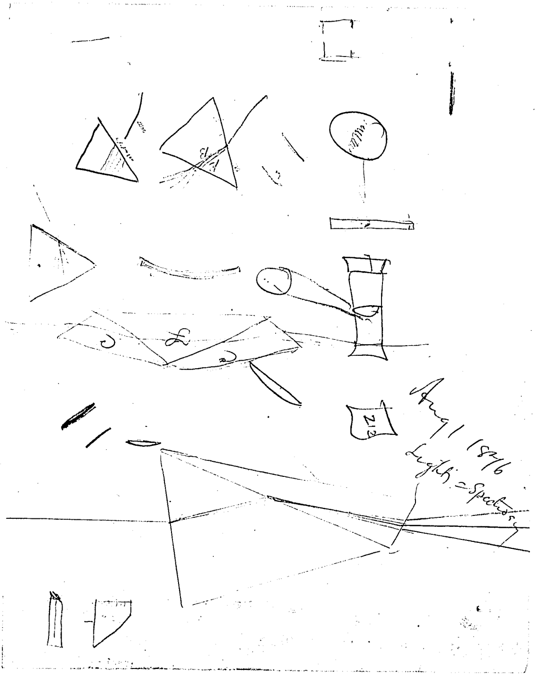
Acoustic transfer
Aug 1 1876
TAE



Aug 1. 1879
337


Line
Earth
Earth

Acoustic Transfer
duplex Aug 1 1876
TA Edison



Aug 11 1876
Light - Spectrosc

101/10 Genl Tel Int
Oct 8 & 9

Oct 8 & 9
Genl Tel Int
102/10

103/10 Oct 8 + 9 1880
Gen Tel Int.

104/10 October 8 + 9
General Tel Interference

EDISON'S EXHIBIT. 101-10.

- Edisons Exhibit 101-10 -

August 2nd 1876.

Experiments in Electric Talking Telegraphs.

Up to the present date we have tried a great many plans, a few of which are described below:

In our first experiments we found the parchment diaphragm in the transmitter could not be kept in adjustment owing to the expansion and contraction from moisture of the breath - a thin brass diaphragm was substituted which entirely overcame this difficulty but otherwise gave no better results = a brass diaphragm in the receiving instrument is inferior to parchment owing to a metallic ringing sound it gave.

Tubes of various sizes ranging from 3½ inches to ¼ have been tried but our best results were obtained with a two inch diaphragm brass in transmitter parchment receiver with 3 ohm spool 2 cups

EDISON'S EXHIBIT. 102-10.

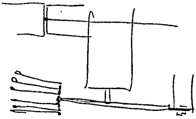
- Edison's Exhibit 102-10 -

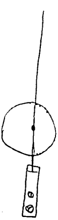
of carbon short circuit shunting the sender with about 40 ohms - singing in any key can be transmitted accurately. Solid and spring contacts have been tried small platinum points and large brass discs, also discs & knife blade contacts with no gain.

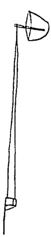
An arrangement of one box with 5 diaphragms of different size ranging from 4 in to 1 inch, no advantage.

A box with 3-2 inch diaphragms was tried each working independent & connected so as to throw in and out resistance various other changes were made in the connections.

Induction, static discharge, primary & secondary currents - on all the above & on nearly all of the connections singing





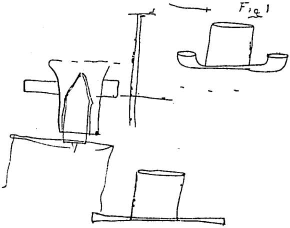


EDISON'S EXHIBIT. 103—10.

- Edison's Exhibit 103-10 -

could be transmitted perfectly - also playing on the cornet can be transmitted perfect- a plan which for want of perfect apparatus was not thoroughly tested is constructed on a very satisfactory plan & will undoubtedly be a great improvement. a good model will be constructed a thorough test made at once. A platinum wire is attached to the diaphragm & immersed in a solution or liquid resistance the strength of the wave is by this means varied according to the amplitude of the diaphragm Various improvements & modifications of this plan are proposed such as shown for increasing amplitude diamond shaped immersing point of aluminum.

Another plan is to be place chemical paper between contact points & the variation in pressure of diaphragm gives corresponding variations.

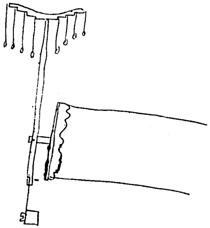


EDISON'S EXHIBIT. 104-10.

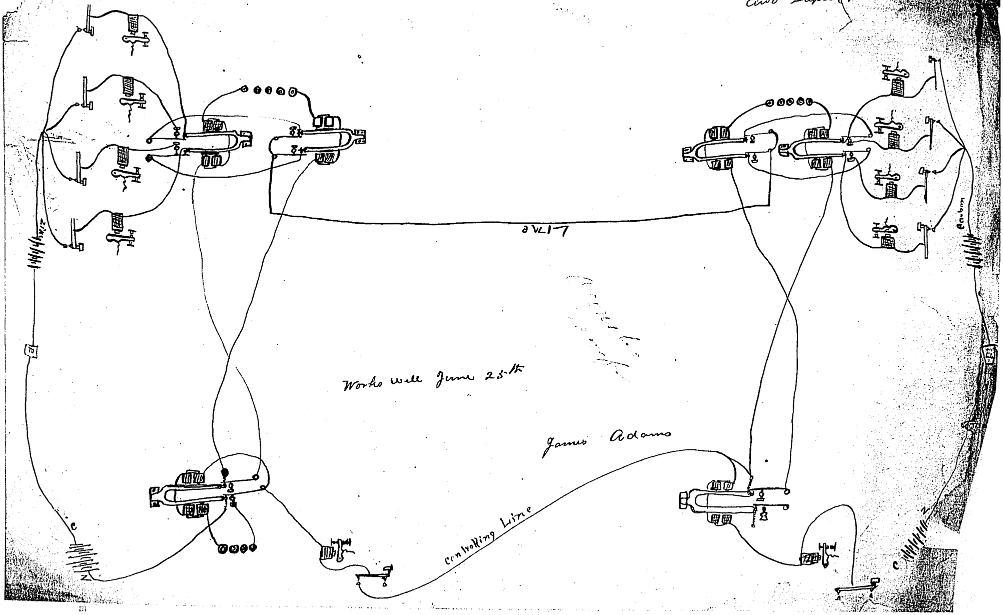
– Edison's Exhibit 104 - 10 –

strength of wave. The sketch on the back of this sheet is a plan proposed by Edison & will be tried in due time: the introduction of saturated felting in place of chemical paper is also proposed.

The following plan will be tried at once represented in Fig. 1. on opposite page - diaphragms arranged to force out water against a counterbalancing diaphragm the talking diaphragm is placed in close proximity to metal plate leaving only small amount of solution to be vibrated the two counter-balancing diaphragms furnish elasticity.



Sent 4 mi[illegible] to return circuit from Laboratory
Philadelphia to Aug 2
and Duplex the [illegible]


Zinc
Line
Carbon
C
Z
Controlling Line

Works well June 25th

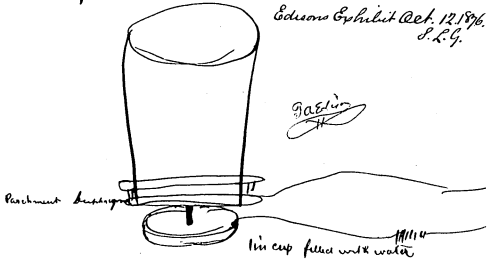
James Adams

EDISON'S EXHIBIT. 105-10.
OCT. 12. 1876.

5

Speaking Telegraph

Edisons Exhibit Oct. 12.1876.
S.L.G.


Parchment diaphragm
Tin cup filled with water

T A Edison

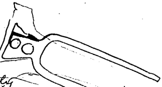
James Adams

This works but not so good as Plumbago on hard rubber. tried mercury instead of water but it is a dead make & Break

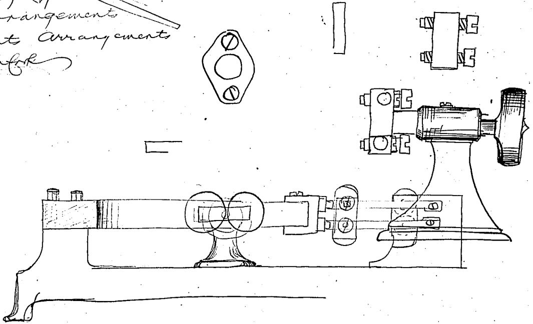
Oct 12th 1876

James Adams James Adams
James Adams James Adams
James Adams

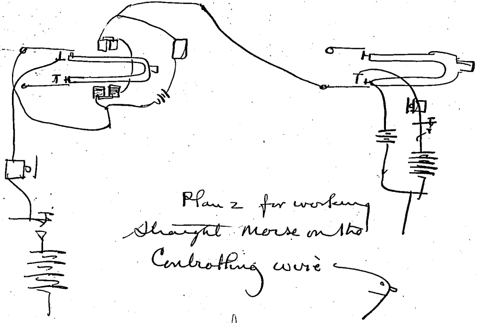
Boston
Boston
Boston Loyal
Loyalty Loyalty
Mutual Arrangement
Arrangements arrangements
Arranged for



Acoustic Transfer
Aug 2 1876
TAEdison



Aug 6 1876 —

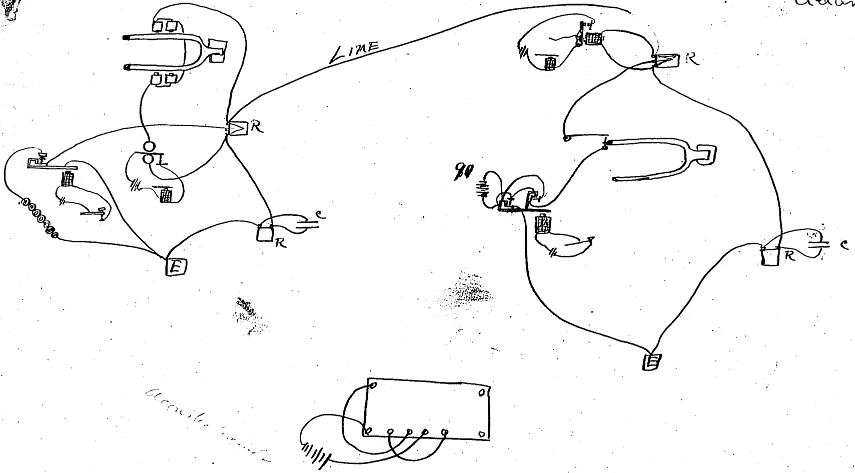


Plan 2 for working Straight Morse on the Controlling wire

James Adams

Aug 6 Duplex [illegible]
line return circuit [illegible] Philadelphia
Works Bang up

Adams

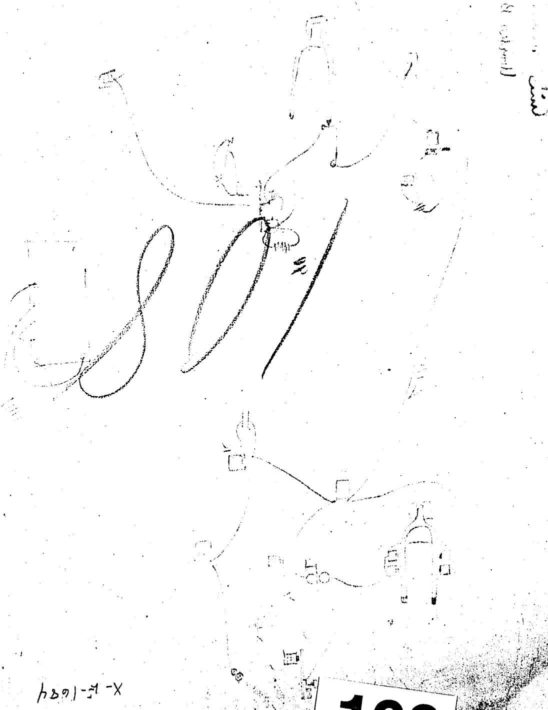

LINE
R
R
R
R
L
E
E
C
C
99

Accumulator [illegible]

Repeated 300 words per minute by Electromotograph on a round circuit via Philadelphia 140 miles

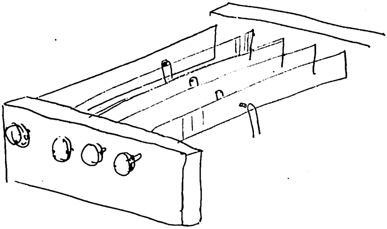
Aug 9 1876

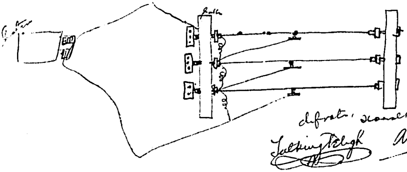
Adams



X-5-1684

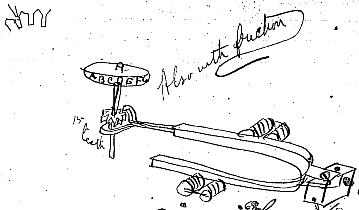
EDISON'S EXHIBIT. 109—10.





difrats, consonants shewn

Talking Telegh Aug 10 1877 TAE


A
ABCDEFG
15 teeth

Also with friction

68

120, Aug 20th 1876

Acoustic Printing Telegraph

Invented by

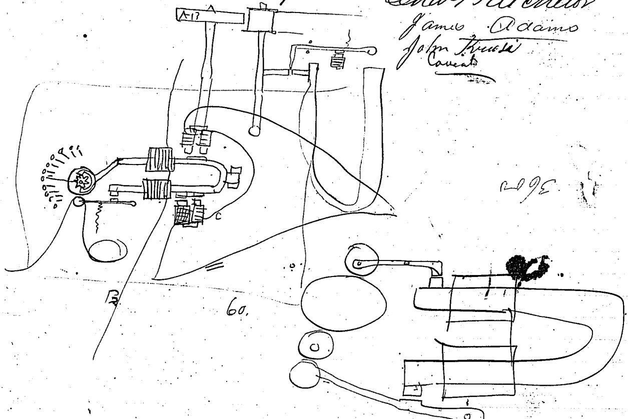
T A Edison

Chas Batchelor

James Adams

John Kruesi

Caveat



3600

60.

26
26898 2 2

75,000

75,000
"

26

19. 100,

6

9600 75,000
15678905600

5700
22.10
850.109.00.
19

960

75000
11,000

Morning Power Power Power

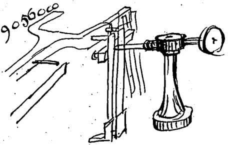
Powdered Pumice

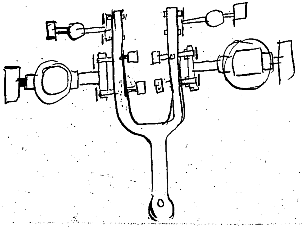
Port Huron.

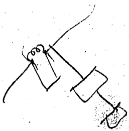
Pumice Stone

Portland

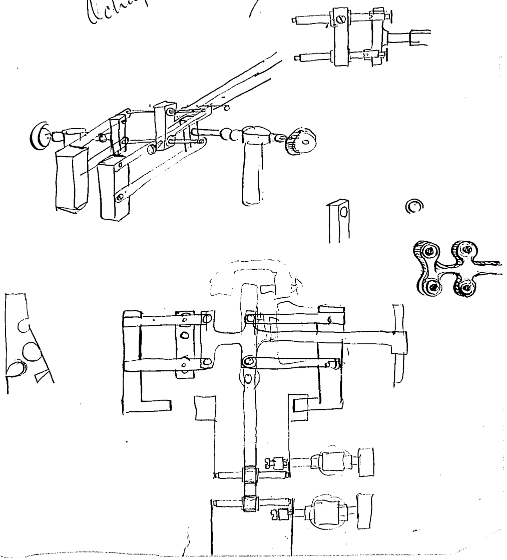
Port Huron
Port Huron
Port Huron
Port Huron







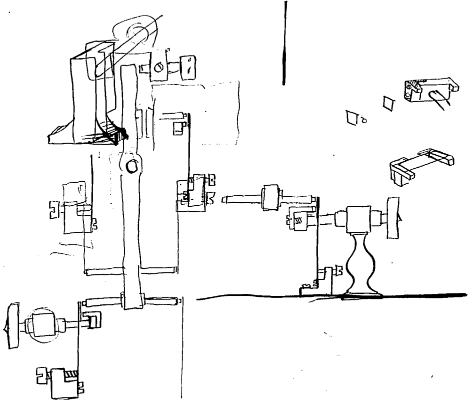
Achuplex Oct 6 1876. T A Edison

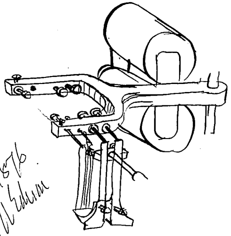


NOW IS THE WINTER OF OUR DISCONTENT

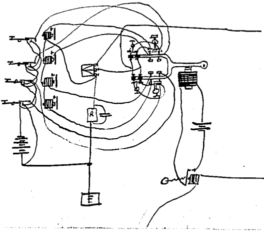
Octruplex Oct 6 1876

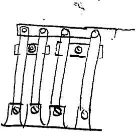
T.A. Edison



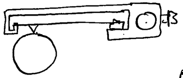


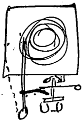
Murphy
Oct 6 1876
TA Edison

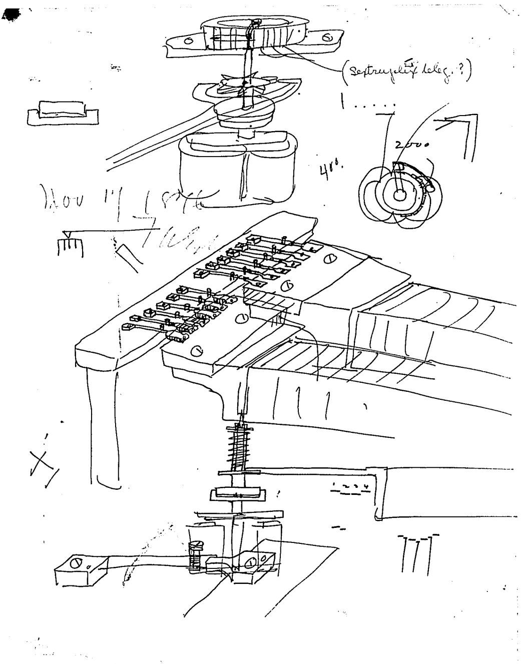




Nov 2 1886 TAE.






(Sextruplex teleg. ?)
2000
4 ft.
Nov 11 1878